United Nations A/71/222

General Assembly

Distr.: General
27 July 2016

Original: English

Seventy-first session
Item 21 (b) of the provisional agenda*
Globalization and interdependence: international migration and development

International Year of Light and Light-based Technologies, 2015

Note by the Secretary-General

The Secretary-General hereby transmits the report prepared by the Director General of the United Nations Educational, Scientific and Cultural Organization in accordance with General Assembly resolution 68/221.

* A/71/150.

16-13065 (E) 040816

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Report of the Director General of the United Nations Educational, Scientific and Cultural Organization on the implementation of the International Year of Light and Light-based Technologies, 2015

Summary

The United Nations International Year of Light and Light-based Technologies, 2015 was proclaimed by the General Assembly in its resolution 68/221. The International Year was officially launched at the headquarters of the United Nations Educational, Scientific and Cultural Organization in Paris on 19 January 2015 and closed on 6 February 2016 in Mérida, Mexico.

In accordance with resolution 68/221, the present document provides a report on the implementation of the International Year, including its main achievements and legacy actions. The document is based on consultations with a wide range of stakeholders.

I. Background

1. At the request of Ghana, Mexico, New Zealand and the Russian Federation, an item on the proclamation of 2015 as the United Nations International Year of Light was included in the agenda of the 190th session of the Executive Board of the United Nations Educational, Scientific and Cultural Organization (UNESCO). In its decision 190 EX/Decision 47, the Executive Board invited the Director General to support all efforts leading the General Assembly to proclaim 2015 as the International Year of Light. Following the adoption of resolution 37 C/Res.25 by the General Conference of UNESCO at its thirty-seventh session, the International Year of Light and Light-based Technologies, 2015 was proclaimed by the General Assembly in its resolution 68/221. In its resolution, the Assembly requested that UNESCO, mindful of the provisions of paragraphs 23 to 27 of the annex to Economic and Social Council resolution 1980/67, inform the Assembly at its seventy-first session on the implementation of the resolution.

2. The organization of the International Year was implemented through the UNESCO International Basic Sciences Programme and an operational global secretariat hosted at the UNESCO category 1 institute, the Abdus Salam International Centre for Theoretical Physics. The choice of the Centre as global secretariat was motivated by its strong links with international optics organizations through its Trieste Optical Sciences Advisory Board and its participation, together with the Programme, in the Active Learning in Optics and Photonics initiative of UNESCO.

3. The International Year afforded an unparalleled opportunity to demonstrate the importance of light science and its applications in contributing to the 2030 Agenda for Sustainable Development. In particular, light-based technologies contribute directly to the effective achievement of the Sustainable Development Goals, given that they provide practical and cost-effective solutions to challenges in areas such as agriculture and food science, energy and the environment, poverty eradication, water purification, combating diseases and climate change. Moreover, light science is an inspiring subject to stimulate children's interest in education, and industries based on photonics are major economic drivers. A central aim of the International Year was to raise global awareness of the importance of those issues and to stimulate associated capacity-building and research in the basic sciences and engineering. It also promoted the themes of visual arts and culture, architecture and light pollution, all of which resonated with the objectives set out in resolution 68/221.

II. Administrative matters

4. The International Year brought together hundreds of national and international partners in a multidisciplinary consortium. It was endorsed by a number of scientific unions and the International Council for Science. Among the scientific community, the founding partners were the American Institute of Physics, the American Physical Society, the German Physical Society, the European Physical Society, the Abdus Salam International Centre for Theoretical Physics, the IEEE Photonics Society, the Institute of Physics, Light: Science & Applications, Lightsources.org, 1001 Inventions, the Optical Society and SPIE. Patron sponsors included Bosca, Royal Philips, the International Association of Lighting Designers, Thorlabs and

Underwriters Laboratories. Major associate (Gold+) partners included Axis Lighting, the China International Optoelectronic Exposition and the International Commission on Illumination.

5. With regard to governance, a steering committee provided overall direction for the planning of activities and an advisory board facilitated extensive interaction with a range of international partners. Key members of the steering committee included John Dudley (New Zealand, Chair), Ana María Cetto (Mexico, Vice-Chair), Maciej Nalecz (former UNESCO Director, Division of Science Policy and Capacity-Building, 2014-2015, member), Jean-Paul Ngome Abiaga (UNESCO International Basic Sciences Programme, member), Joseph Niemela (Abdus Salam International Centre for Theoretical Physics, member) and Francis Allotey (Ghana, member). The members of the steering committee and advisory board, of whom 35 per cent were women, represented 25 countries.

6. Although clear governance was necessary to provide a framework to guide international actions, all citizens around the world were encouraged to participate in the International Year and could do so by means of a simple request to the UNESCO International Basic Sciences Programme or the global secretariat for endorsement of their planned activities. That process was implemented efficiently through the establishment of national coordinating committees in 94 countries with authorization to endorse local activities. The membership of national committees was approved by the steering committee. Not all countries used a formal national committee structure, but rather activities were planned by ad hoc organizing committees. In total, International Year activities reached 147 countries.

7. The International Year was financed entirely from extrabudgetary resources raised through the actions of the steering committee and global secretariat. The search for sponsors began in January 2014 and continued until February 2016. The diverse nature of potential participants suggested a strategy of crowdfunding, seeking modest funding from a large number of sponsors. A multi-tier sponsorship model was used and support was sought from scientific and other societies, universities and similar organizations, philanthropic foundations and the private sector. Sponsorship contributions ranged from €500 to €50,000. At the end of 2015, the International Year had received €550,000 from 119 sponsors, which was placed in a dedicated global fund account held at the Abdus Salam International Centre for Theoretical Physics global secretariat run by its Office of External Activities. Budget oversight of the fund was provided by the bureau of the steering committee, which approved all expenditure from the fund. Some 55 per cent of sponsorship came from the private industry sector, with the remainder from, among others, public institutions, public-private partnerships, charities and foundations.

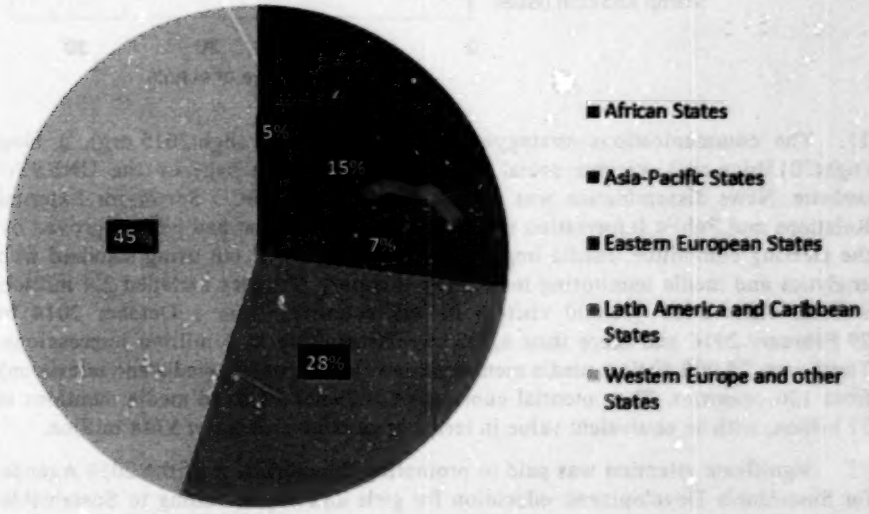
8. An indicative breakdown of expenditure, including budgeted expenses in 2016, from the global fund is as follows: opening and closing ceremonies (35 per cent); Active Learning in Optics and Photonics programme (10 per cent); conferences at UNESCO headquarters (10 per cent); support for worldwide events (15 per cent); administration and communications (10 per cent); and legacy actions (20 per cent). Some founding partners, notably the Abdus Salam International Centre for Theoretical Physics, the European Physical Society and SPIE, donated considerable staff time to organize the international programme of the International Year, allowing administrative costs to be kept very low. Global fund sponsorship, however, represented only a very small fraction of the total budget. Estimates

provided by partners for fundraising by national committees, as well as in-kind contributions and volunteer time, suggest a total cost of more than €15 million.

III. Activities and impact

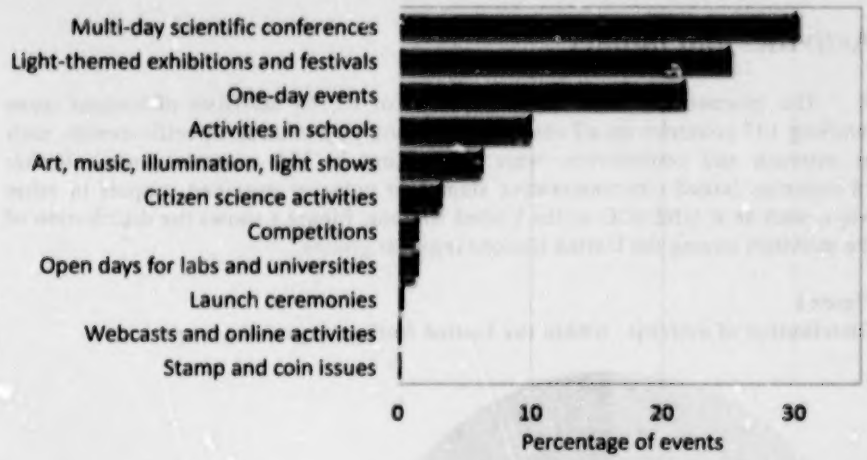
9. The International Year included a total of 13,168 activities of various types reaching 147 countries on all continents, including Antarctica. Specific events, such as outreach and conferences, were carried out in 129 countries and a further 18 countries issued commemorative stamps or coins or provided support in other ways, such as at UNESCO or the United Nations. Figure I shows the distribution of the activities among the United Nations regional groups.

Figure I
Distribution of activities within the United Nations regional groups



10. An indicative breakdown of the distribution of activities is as follows: multi-day scientific conferences (30 per cent); light-themed exhibitions and festivals (25 per cent); one-day conferences and special events (22 per cent); activities in schools (10 per cent); art and music and light shows (6 per cent); citizen science activities (3 per cent); and other, such as light-themed competitions, open days, launch events, stamps and coins (4 per cent). See also figure II. The estimated reach of all activities worldwide is estimated to exceed 100 million people.

Figure II
Indicative breakdown of events by category



11. The communications strategy employed a website (light2015.org), a blog (light2015blog.org), various social media accounts and a page on the UNESCO website. News dissemination was done through the UNESCO Sector for External Relations and Public Information and 28 media partners that had been approved by the steering committee. Media impact studies were carried out using standard web analytics and media monitoring tools. Key summary statistics included 2.4 million website visits from 600,000 visitors in 190 countries from 1 October 2014 to 29 February 2016 and more than 6,000 tweets resulting in 4 million impressions. There were 23,000 distinct media mentions (newspapers, online media and television) from 120 countries. The potential cumulative audience of these media mentions is 37 billion, with an equivalent value in terms of paid advertising of $348 million.

12. Significant attention was paid to promoting the objectives of the 2030 Agenda for Sustainable Development: education for girls and boys (relating to Sustainable Development Goal 4); capacity-building for innovation with local benefit (relating to Goal 9); promoting gender equality in science (relating to Goal 5); and contributing to means of combating climate change (relating to Goal 13), in terms of both developing new technologies to guide policy decision-making and encouraging solar-based energy or energy-efficient light-emitting diode lighting solutions (relating to Goal 7). Emphasis was also placed on awareness-raising of how light-based science and technology could improve societies and help them to harness the full possibility of a sustainable life (relating to Goal 11) and the importance of light and light-based technologies in achieving poverty alleviation (relating to Goal 1).

13. Another significant measure of the impact of the International Year can be seen in the number and diversity of the stakeholders involved, which included representatives of the public and private sectors, civil society actors and scientific academies and research institutions. Reinforcing partnerships across the globe (relating to Goal 17) was a central objective and outcome. The new collaborations put in place during 2015 have enhanced global knowledge of the importance of

science as a central pillar for development and the specific role of light as a multidisciplinary theme.

IV. High-level events with the participation of the United Nations Educational, Scientific and Cultural Organization

14. The opening ceremony of the International Year was held at UNESCO headquarters on 19 and 20 January 2015. The 55 speakers included UNESCO leaders, five Nobel laureates, distinguished international scientists, students, representatives of non-governmental organizations (NGOs) and industry chief executives. The speaker programme was complemented by cultural performances, displays of educational resources, art and music and an exhibit on the "1001 inventions and the world of Ibn Al-Haytham" global campaign. The exterior walls of the UNESCO Fontenoy Building were also lit for three nights in the colours of the aurora borealis.

15. The closing ceremony was held in Mérida, Mexico, from 4 to 6 February 2016. In a message, the Secretary-General stressed that the International Year had shown how the science of light, photonics and related technologies could promote sustainable development in many fields. The 47 speakers included two Nobel laureates. Interactive panel discussions among the 300 participants defined follow-up actions for the future. The ceremony was accompanied by art events, a high school outreach programme, a film festival and a light installation at the archaeological site Chichén Itzá.

16. Other high-level events included two conferences at UNESCO headquarters as part of the information meeting of the UNESCO Executive Board on the organization's Future Prospects initiative, with the participation of Nobel laureates William D. Phillips (on 21 January 2015) and Hiroshi Amano (on 8 June 2015), the launch of the International Year in Algeria on 11 April 2015, in which the UNESCO Director General participated, and the world's largest photonics conference, held in Germany on 22 June 2015, and the opening of the conference on the Islamic golden age of science for the knowledge-based society, held at UNESCO headquarters on 14 September 2015, in which the UNESCO Assistant Director General participated. The International Year and the theme of Ibn Al-Haytham were also included in the World Arabic Language Day programme on Arabic language and the sciences, held at UNESCO headquarters on 18 December 2015.

17. Other significant events included the African regional conference and exhibition on harnessing light and light-based technologies for Africa's development, held in Accra from 14 to 16 September 2015 and organized by the Ghana National Commission for UNESCO; a session on the International Year, co-organized by UNESCO, held at the World Science Forum in Budapest on 6 November 2015; a side event to the 2016 Economic and Social Council Youth Forum, held at United Nations Headquarters in New York on 2 February 2016 and hosted by 1001 Inventions and the Permanent Mission of Saudi Arabia to the United Nations, in partnership with UNESCO.

V. Other high-level events and high-level support

18. Several countries obtained high-level support and patronage from Heads of State. Such support included Queen Letizia of Spain chairing the Spanish Committee of Honour of the International Year of Light; Prince Andrew, Duke of York, serving as Patron of the International Year in the United Kingdom of Great Britain and Northern Ireland; the President of Ireland, Michael D. Higgins, serving as Patron of the International Year in his country; and the President of France, François Hollande, acting as Patron of the International Year in France. In addition, the President of Ghana, John Dramani Mahama, provided a message for the African regional conference and exhibition on harnessing light and light-based technologies for Africa's development.

19. Several Governments officially recognized the International Year. The National Assembly of the Republic of Korea passed a resolution in support of the International Year on 16 February 2015. The House of Representatives in Puerto Rico passed a resolution in support of the International Year on 1 June 2015. The International Year was highlighted in a speech to the Senate of the United States of America on 17 December 2015. In the United Kingdom, two events were organized by the Parliamentary and Scientific Committee. The closing of the International Year in Andorra was celebrated at the headquarters of its Parliament. In addition, member of the Duma and Nobel laureate Zhores Alferov spoke on the International Year before the Russian parliament.

20. The philatelic programme of 26 countries and territories celebrated the International Year. Stamps were issued by Algeria, Antigua and Barbuda, Bosnia and Herzegovina, the Central African Republic, Equatorial Guinea, the Gambia, Grenada, Guyana, Israel, Italy, Kyrgyzstan, Liechtenstein, Maldives, Malta, Mexico, Portugal, the Republic of Moldova, Saint Kitts and Nevis, Sao Tomé and Principe, Serbia, Sierra Leone, Spain, the United Kingdom and Uruguay, as well as by the Holy See and Montserrat. San Marino and Spain also issued commemorative coins.

VI. Selected themes and events

21. With such a large number of events taking place during 2015, it is difficult to select highlights without leaving out some that were truly exceptional. The short selection and descriptions contained in this section are intended to provide a snapshot of how the International Year was implemented around the world.

22. Many countries chose light as the theme for important national science education initiatives, which included the "Week of science" in the Democratic Republic of the Congo in April 2015, the school theme of National Science Week in Australia in August 2015, the "National week of science and technology" in Brazil in October 2015, the "Fête de la science" in France in October 2015 and the twenty-second "National science and technology week" in Mexico in November 2015. Other light-based themes were selected for national or regional focus in, for example, Argentina, the Czech Republic, New Zealand and Spain (Canary Islands). Regionally, the European Commission provided €2.65 million for coordination and support in 30 European countries to promote the importance of light science and careers in photonics to young people, entrepreneurs and the general public.

23. Raising the visibility of the basic sciences was a major activity of many partners. The broad theme of light allowed the European Organization for Nuclear Research (CERN) to carry out awareness-raising activities within the framework of its High Luminosity Large Hadron Collider project to upgrade the collider and to communicate its involvement in and support for the Synchrotron-Light for Experimental Science and Applications in the Middle East. CERN also selected light as its theme for the "European researcher's night" on 25 September 2015, and the Synchrotron-Light for Experimental Science and Applications in the Middle East was the subject of high-profile articles by former CERN Directors General Rolf-Dieter Heuer and Chris Llewellyn Smith.

24. The theme of light poverty was used to raise awareness of the fact that some 1 billion people still do not have access to electricity and reliable lighting infrastructure, severely limiting their socioeconomic development. Patron sponsor Philips Lighting and other partners, including social businesses, implemented actions on light poverty in many countries worldwide, such as Chile, Guatemala, Kenya, Namibia Peru, the Philippines, South Africa, the United Republic of Tanzania, Uganda, Zambia and Zimbabwe.

25. Many activities from founding partners and national committees promoted careers in science and engineering for girls and women. Panel discussions, seminars, prizes and posters were used to communicate career opportunities for women, and events such as networking receptions served to place university students in contact with prominent role models and mentors. For younger children in Australia, the national programme team of the Girl Guides prepared a resource set of suggested activities on the theme of light.

26. Some initiatives focused on those affected by war and natural disasters. The "Physics for all" activity of the German Physical Society brought the themes of the International Year to newly arrived refugee communities in Germany. The Nepalese national committee for the International Year prioritized activities for students and schools in areas affected by the earthquake in April 2015.

27. The works of Ibn Al-Haytham were frequently highlighted in events organized by national committees, an international Ibn Al-Haytham working group and founding partner 1001 Inventions. A two-day conference on the Islamic golden age of science for the knowledge-based society was held at UNESCO headquarters from 14 to 15 September 2015 and included an exhibition from the Qatar National Library on the preservation of the cultural heritage of Islamic manuscripts. Overall, events on Ibn Al-Haytham were held in 29 countries: Algeria, Bahrain, Brazil, Canada, China, Egypt, Eritrea, France, India, Indonesia, Iran (Islamic Republic of), Iraq, Israel, Jordan, Kuwait, Lebanon, Malaysia, Mexico, Morocco, Oman, Qatar, Saudi Arabia, Senegal, Tunisia, Turkey, the United Arab Emirates, the United Kingdom, the United States and the State of Palestine.

28. International Year partners participated in awareness-raising actions at the twenty-first session of the Conference of the Parties to the United Nations Framework Convention on Climate Change, held in Paris from 5 to 12 December 2015. The "Human energy project" installation promoted renewable energy sources to light up the Eiffel Tower, the "Phares" project installed an energy-efficient beacon of light sculpture at the Place de la Concorde, the NGO Liter of Light promoted ecologically sustainable and cost-free lighting in developing countries and

the "Flowers of change" installation was a participatory artwork linking ideas of light, colour and ecology.

29. Events promoting astronomy and dark skies were carried out worldwide. Activities of the International Astronomical Union included the "Galileo mobile" outreach project, which took place in 20 schools in South America, and the "Globe at night" citizen science collection of dark sky data in 104 countries. A major open-access collection of images and photographs on light themes, "Light beyond the bulb", was shown in 682 exhibits in 40 countries and translated into 12 languages. Many partners also organized observing events of the solar eclipse of 20 March 2015 and the lunar eclipse of 27 September 2015.

30. The symbolic power of light was underlined with the illumination of major monuments and buildings worldwide, including the UNESCO World Heritage Site of the old port of Valparaíso, Chile, the "Night of heritage light" in the United Kingdom on 1 October 2015, during which nine UNESCO World Heritage Sites were lit, and the celebration of the United Nations seventieth anniversary on 25 October 2015 that saw 300 iconic monuments around the world lit up in the blue of the United Nations flag.

31. Many events used innovative means to highlight to the general public the importance of light and light-based technologies. In the Netherlands, technology developed for astronomy research was used to project a rainbow station arch on the Amsterdam central railway station in a true colour art installation seen by millions. The theme of light was used to create novel garden displays in Poland and the United Kingdom. Light and poetry and literature were combined in activities in Australia, the Russian Federation and the United Kingdom. More than 100 light-themed videos and documentaries were used for education and outreach. Seven original musical compositions were also inspired by the International Year.

VII. Legacy and continuing actions

32. The International Year forged many new links and collaboration between decision makers, industry leaders, scientists, artists, social businesses, NGOs and the public at large. Partners are committed to working together and continuing initiatives in the future, and some specific actions are already under way, including improved coordination in outreach and science education through expanded regional hubs, such as the European Centres for Outreach in Photonics, and increased support for the projects and scholarships of the African Laser Centre; continued initiatives promoting the economic importance of light-based technologies, such as Photonics21 in Europe, the Photonics Initiative of South Africa and the National Photonics Initiative of the United States; increased awareness-raising of the scientific heritage of Ibn Al-Haytham through a wide range of educational materials developed for the International Year and the creation of an Ibn Al-Haytham international society; the expansion of the Active Learning in Optics and Photonics programme of UNESCO; and the promotion of solar energy solutions and light poverty issues in the multipartner "Power for all" initiative.